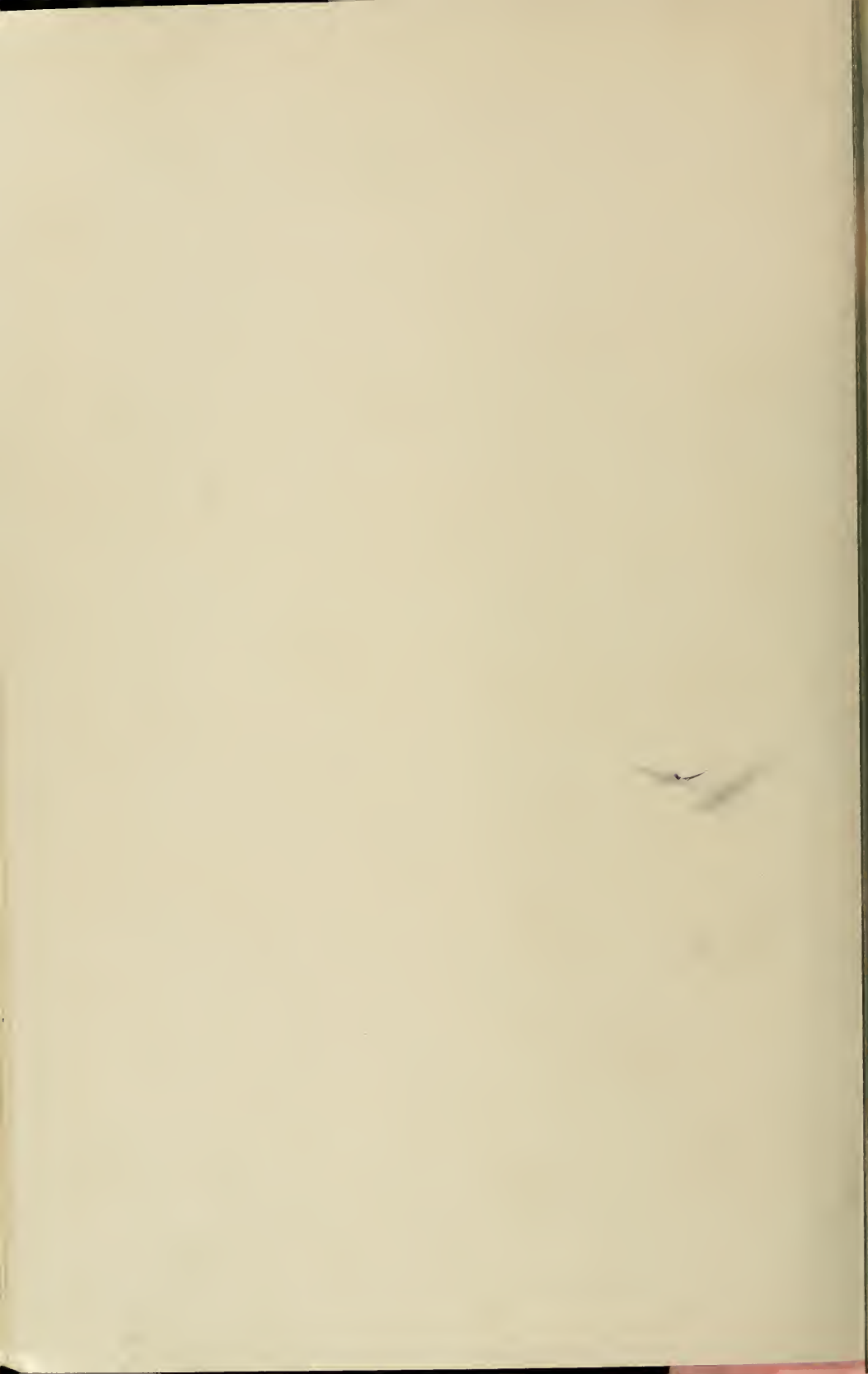


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POWERS THE FARM



WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

From the Director-

Here is a report on farm research.

Every other year we have been telling you of the progress in agricultural science in West Virginia.

Now you may ask, "Why all this energy for agriculture—a going concern?"

I could give numerous answers to that question. Here is one—*We live in a competitive world!*

You know very well how rugged is the Mountain State. How universal are the steep hillsides. How few the level valleys. Yet the census numbers some 100,000 families which depend upon farming for their living.

On these farms, cattle, horses, chickens, sheep, and swine are kept; grain and fruit crops are raised, pastures maintained. Surpluses are sent to market. Today, agriculture stands next to coal in income in the state.

In a free economy such as ours, farmers can do pretty well as they please with their farm operations. The difficulty here is that by such methods, sooner or later, many get into trouble without a system of aids from the outside. Farming gets wasteful, inefficient, costly.

That's where research steps in. One purpose of science is to find ways—in each of your areas of operation—to cut the costs. That may mean improved varieties (like hybrid corn); or better methods of feeding stock; or lime and fertilizer for the land; or conserving water and preventing erosion; or breeding for production, for earlier maturity, and for longer life; or sure control of insects and plant diseases; or efficient marketing of your stock and your produce. In short, better living.

It takes equipment and skilled manpower to run a farm research program like the one that is centered at West Virginia University. The Agricultural Experiment Station is the agency that has been plugging away, in your behalf, since 1888. That makes this the sixtieth anniversary of the founding of the Station.

I started out by saying that we live in a competitive economy. Let me add that the farmer stands to lose in that world, when he is not supported by a full-fledged program of research that looks into every nook and cranny of his enterprise and tries to bring about methods of production and distribution that will mean a continuous profit to him.

CRorton

RESEARCH POWERS THE FARM

The Biennial Report of C. R. Orton, Director of the West
Virginia Agricultural Experiment Station, Morgantown, for
the Period 1946-1948

Compiled by Gerald Jenny, Editor

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Bulletin 334

December 1948

Agricultural Experiment Station
College of Agriculture, Forestry, and Home Economics
West Virginia University

C. R. Orton, Director

Morgantown





IN RECOGNITION

ANDREW DELMAR HOPKINS, Ph. D.

Native of Jackson County, West Virginia. Born August 20, 1857; died in Parkersburg, West Virginia, September 13, 1948. He began his career in science in 1890 as special agent in entomology for the Agricultural Experiment Station of West Virginia University. From 1891 to 1902 he served as entomologist for the Station and was its vice-director from 1897 to 1902, when he became entomologist in charge of forest investigations in the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. Remaining in the federal Department Dr. Hopkins was, successively, senior entomologist, special researcher in bioclimatics, and collaborator, retiring in 1935 to his retreat on the Little Kanawha at Mineral Wells in Wood County.

Dr. Hopkins was a recognized authority on forest insects and on the bioclimatic law. His publications include the development of the science of bioclimatics as well as phenology. He was one of the early breeders of timothy in the United States and an early promoter of the sheep industry in West Virginia.

Dr. Hopkins was married in 1880 to Adelia S. Butcher. There were four children — three sons and a daughter. All but Herbert E. Hopkins, a resident of Pennsboro, West Virginia, preceded their father in death.

The West Virginia Agricultural Experiment Station takes pleasure in according this recognition to one of its illustrious scientists.

Crops and Soils

how many corn plants to the hill?

Where you place that fertilizer in the soil can make a difference in the yield of your crop. D. R. Browning, T. C. McIlvaine, and G. G. Pohlman have found the best returns when nitrogen was applied on top, and phosphates at plow depth. Potash showed no preference between top and bottom. Corn was the crop.

But how many stalks should you plant to the hill? That depends on the natural fertility, the fertilizer applied, and the season, our experimenters say. At Lakin, where they applied 1000 pounds of 5-10-10 per acre, they got 85 bushels from a planting of 3 stalks per hill. They got no more corn when 4 or 5 stalks were planted. By the same token, where no fertilizer was applied, the yield was 42 bushels from a 3-stalk planting. It was 41 bushels from a 4-stalk planting, and only 34 bushels where 5 stalks were planted.

These results were realized in dry weather.

E. H. Tyner carried out a similar experiment in Northern West Virginia. The season (1947) in Monongalia County was one of *ample rainfall*. The fertilizer was applied at the rate of 1000 pounds per acre of 10-10-10. Where 5 stalks were planted, yield was 128 bushels per acre, compared to 102 bushels where only 3 stalks were planted. These results showed us that under high fertility and good moisture, top yields can be

secured only by planting corn thickly. So, with the same amount of fertilizer, we were able to pick up an additional 26 bushels.

During an average season in West Virginia we usually have ample rainfall. On soils that are fertile, or that have been made so with large applications of fertilizer, you may expect greatest returns from planting 5 stalks to the hill.

hybrid corn getting more and more popular

In 1946 nearly one-half of the corn grown in West Virginia was hybrid corn. The yield per acre was about one-fourth greater than the yield when open-pollinated varieties were the rule. Not only that; we grow our corn these days on 25 percent less land than we used 10 years ago.

Together with the Agricultural Extension Service, the Experiment Station has carried on demonstrations of hybrid corn yield tests in 29 counties. These activities have helped immensely to make hybrid corn popular throughout the state.

J. L. Cartledge pursues this hybrid project in numerous other ways, such as: (1) breeding and maintaining inbred lines; (2) making and testing single crosses; (3) producing and testing double crosses; (4) producing foundation seedstocks; (5) releasing new hybrid varieties for seed production.





Red Clover in Corn. Seeded at Last Cultivation

125 bushel corn is possible

Our agronomists have worked with 10 hybrid varieties of corn. They wanted to see what differences there might be in the make-up of the leaves and in the "uptake" of material by the entire plant. Up to now, E. H. Tyner reports, no particular differences have shown up in the content of leaves. But in the uptake of nutrients by the plant, the results aren't the same. It depends on the variety.

Through use of adapted hybrids, enough fertilizer, and higher planting rates, says Tyner, many farmers could grow 125 bushels to the acre. State average is only 40.

wheat, barley, oats, soybeans—

On the opposite page we give you a handy record of Collins Veatch's research in crop varieties. This summary gives the number of varieties tested at four locations in West Virginia. But more important, the high-yielding strains of the 1947 harvest are shown. Also, where possible, the highest-yielding strains over a 5-year period. Seed trials of co-operating farmers are included.

We have held field days at all of our substations. Everywhere the farmers—in large numbers—have shown keen interest in our tests.

SUMMARY OF VARIETY TRIALS, 1947 HARVEST

Location	Number of Varieties	High-yielding Varieties or Strains	
		1947	5-year average
		WINTER BARLEY	
Morgantown	10	Nassau, Wong, Kent. #1	Kentucky #2, Brier, Tenn. #52
U.S.D.A. Nursery	19	Nassau, Brier, Kentucky #1	
Lakin	13	Wong, Scottish Pearl, Brier	Kentucky #1, Scottish Pearl, Brier, Kentucky #1, Kentucky #2
Reedsville	12	Kentucky #2, Scottish Pearl, Kentucky #1	
Wardensville	17	Wong, Kentucky #1, Tucker	*Kentucky #1, Brier, Wong
U.S.D.A. Nursery	19	Davidson, Ludwig, Kentucky #1	
		WINTER WHEAT	
Morgantown	34	X-171-6, Cornell 595, TN-1016-4	Thorne, Fairfield, Purkof
Lakin	21	Thorne, Leapland, Trumbull	Thorne, Trumbull, Fairfield
Reedsville	49	Trumbull, Nured, Fulhio, Thorne	Thorne, Nured, Trumbull
Wardensville	31	Thorne, Nured, Leaps Prolific	*Thorne, Nured, Fulhio, Trumbull, Fairchild
		SPRING OATS	
Morgantown	20	Andrew, Columbia, C. I. 4186	C. I. 4186, Keystone, Columbia
U.S.D.A. early	24	Andrew, C. I. 4186, Clinton	
U.S.D.A. Midseason	21	Zephyr, C. I. 4286, Clinton, Shelby	
Reedsville	43	Mohawk, C. I. 4186, Clinton	Columbia, Keystone, Gopher
Wardensville	26	Andrew, Keystone, Gopher	
		SOYBEANS	
Morgantown	23	Seed Mingo, Hawkeye, Ohio 6151, H-5 Hay Kingwa, Sel. 357, Scioto Viking	
Lakin	9	Seed Scioto, Sel. 359, Lincoln Hay Scioto, Sel. 359, Kinewa	

*Results for only 4 years.



alfalfa may need boron

Boron is one of the lesser elements found in soils and necessary to growing plants. Studies by F. W. Schaller show that generally there is enough boron in our soils for growing alfalfa. But the crop suffers when there's not enough of this element. In fact, lime and fertilizer are likely to step up the need for adding borax—something like 20 pounds to the acre.

Some alfalfa fertilizers now on the market contain boron.

easy to reclaim eroded soils

Our tests show that many eroded areas in West Virginia can be reclaimed rather easily and erosion losses thereby greatly reduced. Planting adapted grasses and legumes, and protecting the areas from grazing, will do the trick.

Farmers, county agents, and Soil Conservation technicians have been kept informed about our success. They have visited the experimental plots. We believe the results have demonstrated the soundness of these practices.

G. G. Pohlman, J. R. Webb, Torkel Holsoe, and H. D. Erickson, as well as D. R. Browning and R. M. Smith of the federal Soil Conservation Service, have been working on this project.

the Road Commission takes a leaf from our book

Slips and landslides in and below spoil banks of strip mines are numerous. S. L. Galpin has examined these as well as 15 serious highway slips and a slip causing damage to a 4-H camp. He has made sound recommendations to the mine inspector and to several operators. In each case, considerably better drainage has been the result. At five road

slips, the measures he has recommended were installed and they have held. Today, where new roads are to be built, better specifications for drainage are written into contracts.

Results of these few cases of effective drainage measures have been striking enough to impress most district engineers of the State Road Commission. From a policy of "back fill and hope" they have changed to one of "dig in and drain" as applied to road slips. The West Virginia Station can properly claim at least some credit for this change of policy. The land of our state stands to gain.

how get around acid mine water?

Spring wells and stream waters in Northern West Virginia are greatly reduced in value through coal mining.

Much acid water drains from active and from abandoned coal mines in many areas. This water is too strong for stock water and for use in the house. It corrodes.

When dairy farming expands, new water supplies must be found. At times this problem has been met by hauling water some miles or by using water from city mains.

Mine water can be treated or neutralized with lime or with hydrated lime. The cost of material, according to S. L. Galpin, is under 1c per barrel of treated water. The sludge produced is bulky, but it makes a good fertilizer for gardens and pastures. The water so treated is satisfactory to stock. (Lime feeders are now available.)

The problem could be solved by many farmers if they established a farm pond on their premises. Enough of these ponds have been installed in the state to demonstrate their usefulness.

Orchards and Gardens

approved varieties of small fruits

Tests of varieties are carried on constantly. W. H. Childs, R. H. Suds, and R. S. Marsh report Midland as an early strawberry of high quality, good for home use. Sparkle is a good late variety.

Athens, an early blue grape, is worth trying in the home vineyard.

The Glendale gooseberry has proved itself way ahead of Downing, Poorman, and Fredonia in ability to yield. The berries are smaller than Poorman or Fredonia but larger than Downing. Glendale plants grow most vigorously. They should be set at least 7'x7'.

The Reber strain of Montmorency cherries has been superior to all others tested at Kearneysville.

adding color can improve apple taste

In our earlier reports our chemists have reported success in adding red color to apple skins. They did this by spraying the leaves of trees with a chemical called "thiocyanate." Since then R. B. Dustman and C. A. Flanders have been studying the inside of apples treated with this spray. Up to now, it seems that this chemical has not changed the total amount of pectin in the apple. But it has brought about some minor changes in the make-up of this pectin. And it has made the fruit less sour.

give orchard good start, then forget the sod

We are half of the opinion that an

orchard sod may as well shift for itself, weeds and all. It is the cheapest way of managing the soil. But if you want a sod that will restore and maintain the fertility of the topsoil and give you mulching material besides, then treatment is in order. R. H. Suds and G. G. Pohlman find that, once the trees have a good start in life, good stands of legumes and nonlegumes can be established. These include bluegrass, bluegrass plus mulch, ladino clover, sweet clover, red clover, crimson clover, and alfalfa. (Removing these crops for hay is not approved.)

Jonathan still the favored seedling

Apple trees on clonal rootstocks tested cannot be recommended for planting in commercial orchards in the Shenandoah Valley. R. H. Suds reports that such trees can't take it when the big winds come. The trees are blown over completely. Or they get to leaning so heavily that they must be straightened; then staked with guy wires. What orchardist wants all that trouble?

Suds has experimented with four scion varieties: Gallia Beauty, York Imperial, Staymared, and Starking. These have been worked onto seedlings from open-pollinated blossoms of several varieties including Delicious, Winesap, and Rome Beauty. Yields of the four scion varieties have been generally unsatisfactory, he reports. He still believes that Jonathan seedling is the best single bet with





Proper Pruning and Training Prolongs Life of Mature Apple Trees

all four scion varieties. But because trees on seedling roots account for most of the U. S. apple crop, Sudds is after seedlings producing superior rootstock.

blueberries and birds

There is a big market in the East for blueberries, and farmers along our Allegheny front could make money if they had a fair-sized berry to sell. For some years now, the West Virginia Station has busied itself with the aim to develop a berry that would sell itself. W. H. Childs has been experimenting with several

thousand hybrids in the hope of getting some promising berries. In the process he has found he can get faster growth when the seedling plants are started in shredded sphagnum moss. In 1947 he made 72 crosses and harvested 534 berries. Many of some 7000 plants grown in the field bloomed and bore fruit that year, the largest about four-fifths of an inch across. Nice berries. The birds thought so, too, much to our chagrin. Childs had to cover the plants with cheesecloth. What those birds will do to an open field of blueberries is almost unbelievable.

Sebago and Katahdin are replacing Rurals

We think we are on the trail of a potato that will produce well under unfavorable conditions. K. C. Westover has been testing a great many seedling selections from numerous sources near and far. Some of the stocks, originally from Beltsville, Maryland, and from other cooperating stations in the Midwest, have been observed for some years. They compare well with standard varieties in our middle altitudes. The plants are vigorous and middling in size and seem able to withstand warm, dry growing conditions.

Sebago and Katahdin are among the newer varieties taking the place of Rurals. Menominee is being accepted for scabby soils. And Houma is gaining in the lower altitudes. Such are the trends observed

by Westover. These varieties, along with Cobbler and a few Green Mountains for growing at high altitudes, make up almost all the certified stocks imported by West Virginia growers. They include about 90 percent of our commercial crop.

biggest yields from larger green-manure rotations

Early cabbage, followed each year by a rye-and-vetch cover crop, is a good rotation. In K. C. Westover's observations it has done as well as 2- and 3-year rotations. He finds the same thing true of early tomatoes, with this exception: longer rotations give the largest total yields. The short rotation does well in truck crop production. The longer ones lend themselves better to production of canning crops, especially if rye-and-vetch and soybeans are turned under.



Trellis Tomato Framing





Part of the 1200 or More that Visited the Experiment Station at the First Dairy Day Program in 1948. Here They Saw and Heard of the Experimental Work in Progress

(Photo courtesy Monongahela Power Co.)

Dairy Stock and Dairying

our dairy herds excel in production and type

The dairy herds at the Experiment Station have made new production records during the past years. The Reymann Memorial Ayrshire herd, during the year 1947-48, reached a new level in production. During this year they produced 10,304 pounds of milk and 474 pounds of butterfat (mature equivalent is 508 pounds butterfat). That is the highest record ever made by this herd. It was made on a strictly two-times-a-day milking. With their high type rating the herd will qualify for the fourth consecutive Constructive Breeder's Award, which is the highest award given by the Ayrshire Breeders' Association.

The Holstein herd during 1947 averaged 11,474 pounds of milk and 456.9 pounds of butterfat on twice-a-day milking. This is also the highest record ever made by our

Holstein herd and they received the second consecutive Progressive Breeder's Award. It is the highest honor given by the Holstein-Friesian Association and was given because of the high production and type of the herd.

The Jersey herd also gave a good account of themselves. They produced during the past year approximately 8550 pounds of milk (average) and 440 pounds of butterfat on two-times-a-day milking. This together with their type rating will qualify them for the Constructive Breeder's Registry given by the American Jersey Cattle Club.

We are very proud that all three of our herds have qualified for these national honors. Practically all of the 175 animals in the herd are being used on experimental trials and for classroom work. They certainly came through with high honors at the fair.

five daughters can prove a sire

Your Experiment Station has thousands of records to be used for research in dairy cattle breeding. One study has been completed recently on the proving of bulls. We found that when unselected daughters are used, 5 daughter-dam comparisons are as reliable as 10 comparisons. Five are enough to tell what future daughters of the bull will produce. But—if only the *best* daughters are used in daughter-dam comparisons, nobody can estimate the production of future daughters with any degree of accuracy.

uniformity of production is not transmitted

If the first few daughters of a sire produce much the same at the pail—is that any clue to what later daughters will do? Not to our knowledge. The first 10 daughters of a sire may all yield between 375 and 425 pounds of butterfat in one year. The next 10 may vary from 300 to 500 pounds. In other words, a sire may not transmit uniformly among his offspring. By the same token, even if all his *daughters* should produce uniformly well, that does not necessarily mean that his *sons* will inherit the ability, and pass it on.

environment counts, too

Growth of dairy cattle from birth to maturity has always engaged the interest of this Experiment Station. Our research has shown that size of dairy cattle at any age is dependent both on inheritance and on environment. Between 30 and 40 percent of the differences in size between cattle at 6, 12, 18, and 36 months of age are caused by differences in their hereditary make-up. Environment must account for the rest.

several ratings are better than one

Our program of type classification has uncovered new evidence. All cows in our Reymann Memorial Ayrshire herd have been classified for type, twice yearly since 1912. A recent study of the classifications shows that cows usually have several different ratings during their lifetime. That is, a cow may classify "good plus" at one time; at the next round she may either drop to "good" or she may be classified "very good." According to our results, several ratings taken together are a better indication of the type that she will transmit to her offspring. Hence breeders can cull out heifers of poor type at an early age by having their heifers type-rated at 6 to 12 months. This will save both feed and labor.

George Hyatt, Jr., and W. J. Tyler are working on the above five projects.

must start with good male stock

The practice of breeding dairy cows artificially has become well established in the United States. West Virginia is no exception, and by now about 6 percent of all females are so bred. But to make such work reliable on a large scale, you've got to start with mighty good male stock. That's where the long-time breeding project of the Experiment Station has taken the lead, peering into the factors that underlie good breeding in dairy stock.

Daughters of unproved sires have been mated to carefully selected young unproved bulls, and daughters of proved sires to outstanding proved sires. Between 1933 and 1944, 33 daughters by *proved* sires averaged 9664 pounds of milk and 413 pounds of fat. Seventy-seven daughters of



W. V. U. Autocratic, Grand Champion Holstein Cow at 1948 West Virginia Dairy Cattle Show and Only Living "Excellent" Cow in West Virginia. She Has Official Record of 14,768 Pounds Milk and 596 Pounds Butter Fat at 2 Years 9 Months of Age

young sires averaged 9480 pounds of milk and 413 pounds of fat. George Hyatt, Jr., W. J. Tyler, and H. O. Henderson are continuing these groups and comparing them from time to time. They are striving to see whether new and better systems of selecting young sires can be found.

This many-sided research in our world-famous Reymann Memorial Ayrshire herd goes back 25 years. Recently a summary of this project was reported in a series of articles appearing in an internationally known dairy paper. The article covered breakdown of breeding and type, selection of proved and young bulls, and inheritance of breeding difficulties. Publication of the record points up the very real importance of this piece of work. The use of outstanding proved bulls has been shown to be most practical. And great improvement in dairy

herds can come about by using young sires that were selected properly.

should heifers be milked before calving?

Many heifers and cows have badly swollen and congested udders before calving. When that happens you don't want to put the animal on full feed. Nor should you bring her into full production until the swelling has gone down. Sometimes the udder gets so full that some dairymen believe that the gland may be injured for good. Breeders often feel that such animals should be milked before calving.

To get information on pre-milking, we divided 16 first-lactation Ayrshire heifers into 2 equal groups. Group I was handled in the usual way. The heifers in Group II were milked for a period of 3 to 18 days with an average of 10 days before calving.

One heifer in this pre-milked group produced only 2 pounds. Another gave 142 pounds this way. The other four were in between. The production on the day of calving for the heifers *not* milked prepartum varied from 2 to 9.2 pounds. The heifers in Group II, which were milked prepartum, varied from one-fifth pound to 25.6 pounds on the day of calving.

Composition of the milk on the day of calving of heifers milked prepartum depended on the total amount produced and on the level of production on that day. Two of the heifers milked prepartum produced milk of normal composition 1 to 3 days before the calf was dropped. Their calves did not receive any colostrum milk.

So far we have only scratched the surface. We need to know more about the changes that take place in composition of the milk before and after calving. Too, what prepartum milking does to the well-being of both dam and calf is of concern to the dairyman. R. A. Ackerman, George Hyatt, Jr., H. O. Henderson, A. H. VanLandingham, and C. E. Weakley, Jr., are working on this.

milk stimulants may not be the answer

We have had some success with feeding thyroprotein to dairy cows during pregnancy and lactation periods, but in numerous cases the health of the animals was affected. George Hyatt, Jr., H. O. Henderson, and A. H. VanLandingham can tell you what the prolonged feeding of this material has done to some of our stock. We now can say only this: thyroprotein can increase milk production for short periods of time. But the long-time effects on the

cows' health may be harmful if fed for several lactations.

Certainly the owners of purebred dairy cattle have not yet reached the stage where they need to use some sort of stimulant that may or may not be harmful to the health of their cows. Feeding and management are the key. . . the right key. . . Improvement here will work wonders in increasing production. So will selection of better bulls. So will selection of better cow families. Those are safe and reliable means for upping production; the health of the cows will be improved rather than impaired.

how to keep off flavors out of refrigerator milk

It sometimes happens that the milk distributor is accused of delivering milk containing an off flavor: chances are, the defect actually developed *after* the milk was delivered. That off flavor can mean less milk bought. To overcome this, the distributor must in some way show that the fault rests with the consumer. He must educate his customers as to the proper storage and care to be exercised while holding milk in home refrigerators.

In our experiment a definite quantity (5 pounds) of a certain fruit or vegetable was placed in the refrigerator together with 4 quart bottles of milk. One bottle was full and capped, one was half full and capped. The other 2, full and half full, were left uncapped. The milk was tested before placing in the refrigerator; it was scored again at the end of 2-day and 3-day periods to study flavor changes.

S. J. Weese found that milk properly capped will not absorb flavors



The Day Was Cold and the Air Was Crisp, so These Steers Blew Their Own Steam as They Waited for Their Daily Ration

so much that the milk is objectionable to the taste. The *uncapped* bottles did absorb flavors to a marked degree; the intensity de-

pended on the particular fruit or vegetable. Cucumbers, onions, and melons were the worst offenders.

Beef Cattle and Sheep

long-time research pays off

Nearly 20 years have passed since C. V. Wilson began a project in topcrossing native sheep with Corriedale rams. By now the experiment has had far-reaching results.

In 1930 he mated native ewes of grade Hampshire type to Corriedales. Wether lambs from these matings were slaughtered for carcass and meat studies. The ewe lambs he kept for fleece and breeding studies. By 1935 he had plenty of data on live and slaughter grades. Dressed yields, too.

On the strength of the findings our Extension animal husbandmen have introduced market-lamb grading, first in cooperative markets and later in auction markets. In 12 years over

600,000 lambs have been coop-marketed direct to packers. Live grades formed the basis of sale. And in the auction markets more than a million lambs have been graded in West Virginia. Counting all the lambs produced in the state, this grading, with *sales based on grade*, has meant more and more market lambs of superior grade.

By "superior grade" we mean higher dressed yields—that is, more meat per 100 pounds of live lamb. And the quality of meat is better. Here the net result is more money per lamb raised.

Another important benefit of this research is seen in the ever-wider use of purebred rams. The West Virginia Purebred Sheep Breeders Asso-

ciation, cooperating with our Extension Service and with the State Department of Agriculture, have distributed to West Virginia producers over 4500 purebred rams of the leading mutton breeds. And in 5 recent years about 100 Corriedale rams have been put in service by farmers seeking to step up the fleece weight and the staple length of their breeding ewes.

Here is a typical example of the time it takes to get all the information, and to secure to the farmer the advantages that are indicated by the data. Farm research data requires a rather long period of time before it pays off.

salt and phenothiazine really gets the parasites

Salt and phenothiazine, 14 to 1, has given excellent control of gastrointestinal parasites in sheep. That result was the final outcome of nearly 20 years of experimental work seeking control methods of gastrointestinal parasites by J. H. Rietz and C. V. Wilson. The results have been carried wherever our Extension animal husbandmen have gone through the state. Data have been kept on 150,000 lambs marketed cooperatively. The percentage of good and choice lambs increased from 30 percent in the years 1942, 1943, and 1944 to 55 percent of the number marketed in the years 1945, 1946, and 1947. Much of this good showing is due to the ever-growing use of the salt-phenothiazine mixture.

Because so many West Virginia farmers have adopted this treatment, the experimenters estimate that sheep producers of the State save \$150,000 a year from lower death rate of ewes and growing lambs, from

higher-grading lambs, and from improved wool.

silage needs no preservative

During summer 1947 two large silos were filled with legume-grass silage. To one of these we added 60 pounds of molasses per ton; the other received no preservative. These ensilages were fed to two lots of yearling Angus steers in the following winter. One lot received the grass silage with preservative, the other lot without preservative. Each lot had the same amount of dry matter. That, plus hay made from the same cuttings, was all the steers had to eat.

The winter gains were almost the same for the two lots.

The nutritional value of silage *without* molasses proved just as satisfactory under our feeding trials as silage *with* preservative.

E. A. Livesay, B. H. Schneider, A. H. VanLandingham, and C. E. Weakley, Jr., are the experimenters. They have made public the results of this work to many groups of farmers. Many have been calling for information and help in regard to filling silos with various kinds of grasses and legumes, especially without preservatives. Our workers have been holding demonstrations of silo-filling in numerous counties.

make-up of feeds is one thing, digestibility another

What goes to make up a feed (composition) and how well it passes through the animal body with benefits to that animal (digestibility)—these two factors have been under constant study by our animal husbandmen. B. H. Schneider has assembled thousands of data, from hundreds of sources, on the composi-



tion and digestibility of feeding stuffs. From some 1100 sources he brought together the chemical analyses of cattle, horses, sheep, swine, and goats. An authoritative book, "Feeds of the World," was one of the outcomes.

The experimenter has gone farther to investigate the nature of feedstuffs. He reports that composition is one thing, and digestibility another. Furthermore, he finds that chemical make-up does not account for all of the differences in digestibility among various feeding stuffs. There are still other factors that come into play, and he is continuing to investigate them.

The chemical composition of a feed does affect how much of that feed is digested and used by an animal. Changes in composition influence the values of feeds directly, for 2 reasons: (1) The feeds may contain *more* of a *desirable* substance, or *less* of an *undesirable* one. (2) Such changes influence the percent-

age the animal gets from the protein, fat, etc. *in each lot of feed.*

Swift & Company have shown their interest in this work with a grant-in-aid to help with the project in each of these 2 years.

Helen Pavlech and Mary Cipolloni are assisting Schneider in this investigation.

stacked hay has its advantages

After 3 years of experimenting, B. H. Schneider and A. H. VanLandingham come to an unexpected conclusion. They find a difference of only 2 pounds gain in weight of growing lambs, in comparing stacked and mow hay. This difference is too small to be worth noting. The researchers are inclined to think that the need for barns to store hay has been overstated.

The Experiment Station has published a bulletin on the subject. You'll find the title in the list of bulletins in the back of this report. Write us for it if you want the details.

Poultry

for better meat in heavy poultry breeds

West Virginia is in the forefront when it comes to developing a broiler program. As a result of extensive research, our scientists have been able to help the poultrymen and hatcherymen of the state in setting up a program for the improvement of meat qualities in heavy breeds.

T. B. Clark and C. J. Cunningham selected some 1500 New Hampshire

pullets known for egg production. They reared 4500 chicks. Then they crossed several breeds, using both mass-flock and single-male matings. They crossed six strains of New Hampshire females with Barred Rocks, and with White Cornish, and with Kansas White Rocks.

Results so far suggest that you can make rapid progress in making better broilers out of your New Hampshire flock by *selective breeding.* You





Rapid Feathering as Indicated by a Tail at 10 Days Is Related to Good Feathering in Broilers and to Rapid Growth

mate the popular broiler males with females from the high-producing strains. This method seems to give satisfaction in hatchery flocks, even with mass-flock matings. High egg production *plus* a good broiler can be expected.

No combination so far tested has shown up better than the Barred Rock/New Hampshire cross for broiler qualities.

strive for low mortality in broiler production

J. H. Clarke has gathered facts from feed dealers for 269 lots of broilers. He also has interviewed 108 producers to find out production costs and practices. One of the important findings was the relationship between mortality and feed and chick costs. These 2 costs came to 86 percent of the total cost of producing broilers.

Some 6 million broilers are grown in the state each year. The main benefit coming out of this study lies in pointing out the importance of

low mortality. If farmers reduced their broiler mortality by only 5 percent, they would cut production costs by more than \$200,000 in this state alone. The way to do this is by sanitation and disease control.

family selection is key to better breeders

We have reached the end of a project seeking to select breeders in relation to long life in S. C. White Leghorns. The project started in 1938, when average egg production was 175, and viability, 65.9 percent. In 1946 the birds averaged 229 eggs and their viability went as high as 93 percent.

H. M. Hyre is able to report a gradual increase since the first year in viability, in egg production, and even in egg size. Such factors, he is convinced, can be increased by *selection on a family basis*. In this way poultry breeders could improve their egg production and viability. Other inherited factors like rapid growth, fast feathering, body conformation, egg size also stand to gain.

something may be missing in ordinary chick rations

Give white rats whole-grain cereals, corn, wheat, and oats. Supplement these with soybean oil meal, steamed bone meal, sodium chloride (salt), manganous sulphate, and cod-liver oil. Give them all that, and you still have a ration that won't assure satisfactory lactation and growth. The offspring may be born all right, but they usually die from poor lactation.

All the vitamins in the book didn't help this lactation problem. A. H. VanLandingham, C. E. Weakley, Jr., and Paul Lyon can tell you the story. Not till they added 2 percent dried pigs' liver to the ration did they notice satisfactory lactation and growth of young. When they injected liver concentrate—such as is used for pernicious anemia—the same good results followed.

The experimenters believe that some unknown factor (a vitamin) is stored in the body during growth. Numerous lactations seem to drain the body of this essential.

This vitamin is present in concentrates of *animal protein*. Hens need it (or a similar vitamin) for good hatchability and for best possible chick growth.

what ration for pullets on range?

You can raise satisfactory pullets in total confinement; or you can raise them on range.

Confine them, and you must give them a normal ration. On range you may feed a normal ration, or a restricted ration of ground whole grains plus bonemeal and limestone. When reared on a good grass range they will thrive even on whole grains and oyster shells fed at liberty. C. J.

Cunningham, T. B. Clark, and J. K. Bletner find that the average annual egg production will be about the same, whichever system is used. But—

The three lots do have important differences. They differ in the time it takes to reach sexual maturity. The confined lots matured first (they got a normal ration). The restricted lots receiving only whole grains and oyster shells on range, from 12 weeks to maturity, didn't mature until about a month later.

These two lots also differ in the size of eggs laid during the first few months of egg production. The confined lots lay the smallest eggs, while the restricted lots on range lay the largest eggs.

The lots fed a normal ration on range were halfway between in reaching maturity.

These points are important for the poultryman wanting large eggs early in the fall, when egg prices are highest. If pullets are to be grown slowly, they must be started earlier and kept on full feed until 12 weeks of age.

"pasting up" not so serious in chicks

Cunningham and Clark have been concerned about the "pasting up" that shows up among many baby chicks. That is the condition referred to when fecal matter gathers around the vent. After 4 years of study they don't consider the disorder as serious. When chicks are taken directly from hatchery to farm and there are no extremes in temperature, there seems to be little need for grain. But when you ship chicks, or when brooding temperatures can't be controlled, the chicks may chill or get overheated. At such



times, the researchers say, it may be well to feed chick grain, alone or with mash, the first 2 or 3 days, to prevent pasting up.

granite plus limestone for eggs?

In my latest report it was stated that crushed limestone is as satisfactory as oyster shells for egg production. T. B. Clark, H. M. Hyre, A. H. VanLandingham, and C. E. Weakley, Jr., found this out in laying trials with both White Leghorn

and New Hampshire pullets. (And the limestone need test no more than 85 percent calcium carbonate.) Now the experimenters report that granite grit supplements the limestone. Feeding this grit freely with limestone upped the egg production about 5 percent more than feeding limestone alone. The extra eggs more than paid for the granite. (But it has to be fed regularly. Feeding grit once a week, they find, is no help.)

Insects and Plant Diseases

temperature and the insect

For many years this Station has been studying the effect of temperature on insects important in this state. In fact, insect studies were among the first scientific investigations carried on in West Virginia. Our entomologists have tried to find out whether changes in climate had anything to do with the abundance of insects—or with dates of appearance. It is their firm belief that the activities of insects are affected by temperature. In general, warmth speeds up the development and increases the activity. Cool weather retards both.

There is a direct benefit that we have been able to pass on to the farmer. You can reduce the losses from your grains by keeping the temperature in your storage bins as low as possible, from early fall until late spring.

Sometimes the effect of temperature does not seem to be very important. The broods of leafhoppers produced during the summer seem

to pay little attention to temperature. The same is true of some other insects. Our studies have indicated that the insects in question do not spend the winters in this climate; they migrate every spring from more southern locations. They reach this region only after the most favorable temperatures have become established. (Temperatures can be too high.) Hence one need not expect much variation in the time it takes for the leafhoppers to produce their broods.

DDT may need some support

This Station used to get more inquiries about termites than about any other insect. In the past few years the Japanese beetle and the European corn borer have attracted more concern from farmers and city folk alike. Before many years pass, the beetle may be controlled by a disease that kills the grubs in the soil.

But the corn borer will require treatment. Growers of field corn

may use insecticide if they can get the right machinery to put it on. DDT is the best at present.

DDT has been widely used for fly control and is still recommended. Still newer materials, used alone or mixed with the DDT, show signs of being even better. Flies may become more or less resistant to the DDT. The combination insecticides will be needed to insure the perfect control that the standby has given.

leaf roller may rival the codling moth

Work at the Kearneysville branch of the Experiment Station under Edwin Gould has demonstrated almost perfect control of the codling moth through DDT. But codling moth may be rivalled in importance by other insects. A species of leaf roller threatened to do great damage this past season (1948). It was stopped by emergency sprays recommended by the Station. These included insecticides of which the general public has heard very little. Parathion is one of these. Another is sometimes called DDD and is closely related to DDT. It is marketed as *Rhothane*. Still another, a new one, is called Chlordan. All of these may be expected to find wider uses in the very near future. We will do our best to keep growers informed on these and other new insecticides which are being developed by the chemists of the experiment stations and by other agencies.

different fruit diseases, different treatments

Peaches: Trials by C. F. Taylor showed that combining zinc with lime, applied with and after the last lead-arsenate spray, helped to correct

the harmful after-effects of arsenicals. Benzene hexachloride proved safe on peaches, as far as causing visible injury is concerned.

Cherries: We have proved to the satisfaction of the sour-cherry industry that fixed copper controls leaf spot, and this fungicide is now standard in the spray schedules for this crop. We are sorry to report a new disease—bitter rot. And West Virginia has the questionable distinction of being the first state in all of North America in which important loss has been sustained. It happened in 1947 in two cherry orchards.

Apples: Scab continues to trouble the apple grower. C. F. Taylor is testing out organic materials as mid-summer sprays. Of the materials tested, he finds that the iron carbamates may have a definite place in the spray schedule.

apple measles and manganese go together

Once in a while a disease comes to light that baffles all efforts to get at the cause. Here the experimenter must be of a suspicious and critical nature. He must know the subject of his inquiry, and the medium in which it lives. Then, cautiously, he must use one treatment after another, and observe the responses.

Until recently, Apple Measles has eluded the search for its cause and control. Anthony Berg, who died early in 1948, and Genevieve Clulo have studied the malady for years. At one time it was thought that the lack of boron in the soil was responsible, but that notion later was discarded. Berg and Clulo did find that diseased trees had a larger amount of manganese in their system than healthy ones. By now



the research has reached the point where recommendations are in order.

Young trees grown on acid soils high in available manganese caught the disease the first year when they were treated with ammonium sulphate and sodium nitrate. The tissues of these trees were high in manganese. Hence we do not advise you to apply these fertilizers when you plant Delicious apple trees on such soils.

The application of hydrated lime, calcium carbonate, and magnesium carbonate prevented the development of the disease on such soils. The tissues of the tree thus treated were low in manganese.

We have a long way to go before we can make complete recommendations.

internal bark necrosis found on bud scales and in bark

In my latest report it was brought out that Internal Bark Necrosis (apple measles) can take place when there is too much manganese in soil. Genevieve Clulo, the project leader, has made a distinct contribution to this investigation into the causes of a disease showing many symptoms. She reports that the disease may be found on the inner and outer bud scales as well as in the bark. It develops very fast near the end of the growing season.

It is important to recognize Internal Bark Necrosis in its various symptoms. Considerable loss often results from trees showing diseased conditions around their bases. It takes many years to observe this disease in the field and to study it in the laboratory.



For Home Gardens a Crank Duster is Handy in Treating Potatoes with Fixed Copper

copper and DDT best spray for potatoes

Weather varies plenty from place to place in a mountainous state like West Virginia. Spray materials, too, vary in their punching power in different parts of the state. Nevertheless, going by results over a period of years J. G. Leach still recommends fixed copper and DDT as the best spray for potatoes. If these are used according to directions, potato yields will be upped 20 to 30 percent. You will have surer control of late blight, early blight, and leafhoppers. This could amount to a million more bushels of potatoes in West Virginia—certainly worth the try.

Leach has also been experimenting with an all-purpose garden dust. Results show that most of the common diseases and insect pests of the garden can be controlled with a single garden dust containing rotenone, DDT, and a fixed copper. In the small garden such a multi-pur-

pose dust would be no more expensive and less trouble than three or four different dust mixtures. Home gardeners will like that.

loose smut of wheat, barley can be whipped

The loose smuts of wheat and of barley are some of the hardest diseases to control. They have caused much loss to West Virginia farmers. It isn't so much of a job to treat the seeds with the hot-water method, if you use the treating machine built by the Experiment Station. That stops the disease germs, just like heat is used to pasteurize milk and make it safe from T. B. and Bang's disease. But here, after treatment with hot water one must restore the original dryness of the grain without disturbing its sprouting ability. This calls for heat of a different sort—dry heat.

J. G. Leach, A. D. Longhouse, and Collins Veatch have been designing a drying machine for just such purpose. In $4\frac{1}{2}$ hours they were able to dry treated grain satisfactorily. At 120° F. they were able to remove all the moisture absorbed in the soaking and treating process.

Well, with this treater and dryer, the problem of loose smut can be whipped.

no rest in fight on chestnut blight

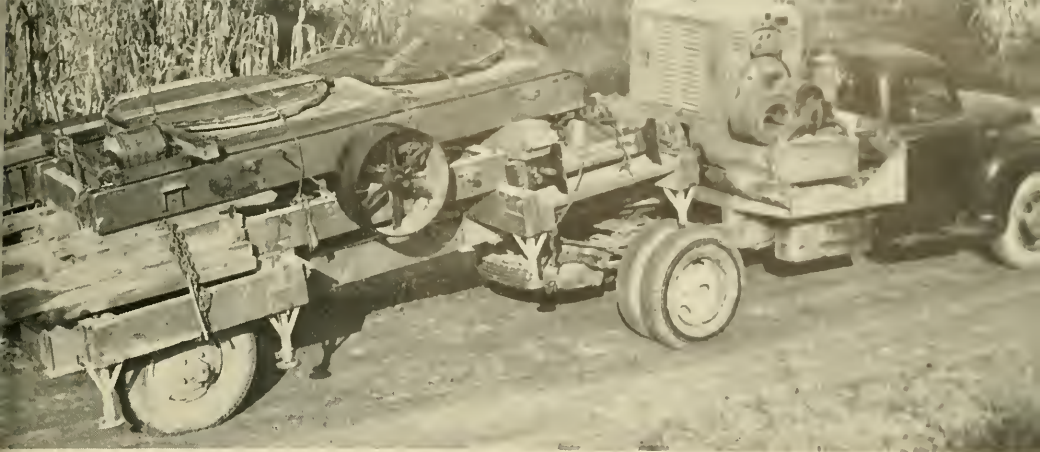
Once in a while one runs across a chestnut tree that has survived the blight. The chestnut is a handsome and useful tree and its passing is mourned by all. But hope will not give up, and some day this species may find its place again among the forest tribe.

Anthony Berg and I found occasional survivors throughout the state and gathered a few nuts. These we planted on the farm in Morgantown, and watched for results.

Some of the seedlings became infected with blight. Many were inoculated, some of which survived. The others are in danger of infection since they are constantly exposed. In time these, too, may be killed with blight unless some of them are resistant. Should any of the resistant trees produce nuts, these will be saved and planted.

Tractor and Power Combine to Spray Potatoes with Fixed Copper and DDT
High Yields of Excellent Quality Can Be Grown in West Virginia if Plants Are
Protected Against Insects and Fungus Diseases





Here is Your Standard-type Portable Mill, Mounted on a Semitrailer, Drawn by a Truck-tractor. The Diesel Power Plant Is Mounted on the Bed just ahead of the Fifth-wheel Trailer Coupling and Stays in that Position while Mill Goes through the Works

(Photo courtesy U. S. Soil Conservation Service)

The Forest World

what's your name for this handy sawmill?

West Virginia's farm woodlots need a mobile, circular sawmill. Our foresters have been designing and testing one. It was designed by J. B. Byers and R. S. Lockwood and it can handle large, heavy hardwood logs. Right now it is going through some tough field tests.

This mill was built to provide a fast-cutting unit that could move from woodlot to woodlot, sawing logs into lumber. That way it would make the woodlot more useful to the farmer. It has been operating in Greenbrier County and more lately in the Clarksburg area. Members of the West Fork Soil Conservation District have been watching it.

The unit can be set up for work in about 3 hours. In 2 hours it can be torn down and loaded for transit. It can travel down the highway at a pretty good clip. Once in the woodlot, it will maneuver through the

backwoods roads like nobody's business. You ought to see it.

Here is one sawmill that doesn't require much timber to justify moving in. It will set up for 10,000 board feet, and sometimes less. It can produce more than 3000 feet of well-sawed, edged hardwood lumber per day. For poplar and pine it will do better than 5000 feet and that includes edging on the headsaw. It can handle logs up to 18 feet long; the diameter is limited only by the size that the 56-inch headsaw can break down.

It ought to have a name!

this state needs equity in forest taxes

Here is a piece of work that can—and should—result in a new law. A law that will show no favors among men. A law that will bring about *a degree of equity in the matter of taxes.*

I refer to forest tax legislation. The Forestry Amendment ratified by

the people of West Virginia in 1946 should be a step forward. There are on our land books huge differences in the assessments of land values. It is to the public interest that these assessments be brought into line—all classes, including cities, industries, farms, and forests.

The 1947 Legislature set up an interim committee to study and recommend forest tax legislation. The findings of Lowell Besley and J. B. Byers should prove very useful to this committee. Bulletin 333 is the report.

tree species identified from the air

Here is a project still in its early stages (like many others). We need aerial photographs that can tell us something of the make-up of a hardwood forest. Sounds fantastic, but such things are possible through science.

There is a film that is highly sensitive to shades of green. With this film Torkel Holsoe and W. C. Percival have been successful in taking pictures from the air. The photographs showed considerable differences in the colors of tree species. This film shows real promise of being helpful in measuring hardwood forests. We believe we can use the pictures to tell yellow poplar, black cherry, beech, and the oaks from each other. From the air, that is.

give the trees more room!

Crown length, crown diameter, and crown surface bear a definite relation to growth around the base of a tree. To Torkel Holsoe this means that diameter growth can be controlled by giving the trees more or less space. What's more, he finds that the butt log of yellow poplar is

about twice as valuable as the fourth log, and one-third more valuable than the second log.

black walnut — bane or boon to crops?

The presence of black walnut has been found to check, or stop completely, the growth of apple and peach trees, potatoes, tomatoes, and alfalfa. The same is true for all members of the heath family. On the other hand, black walnut is a boon to pastures. Under the trees you may find stands of Kentucky bluegrass and other good forage species, even when the surrounding growth is poverty grass, broomsedge, or blackberry. Sheep will eat even the weeds growing under walnut trees (there is less acidity in the soil).

M. G. Brooks, the investigator, suggests that pastures could be improved with black walnut trees, well spaced. The nutmeats make a good source of cash income, and the timber yields a preferred wood.

foxes, farm game, and hunters

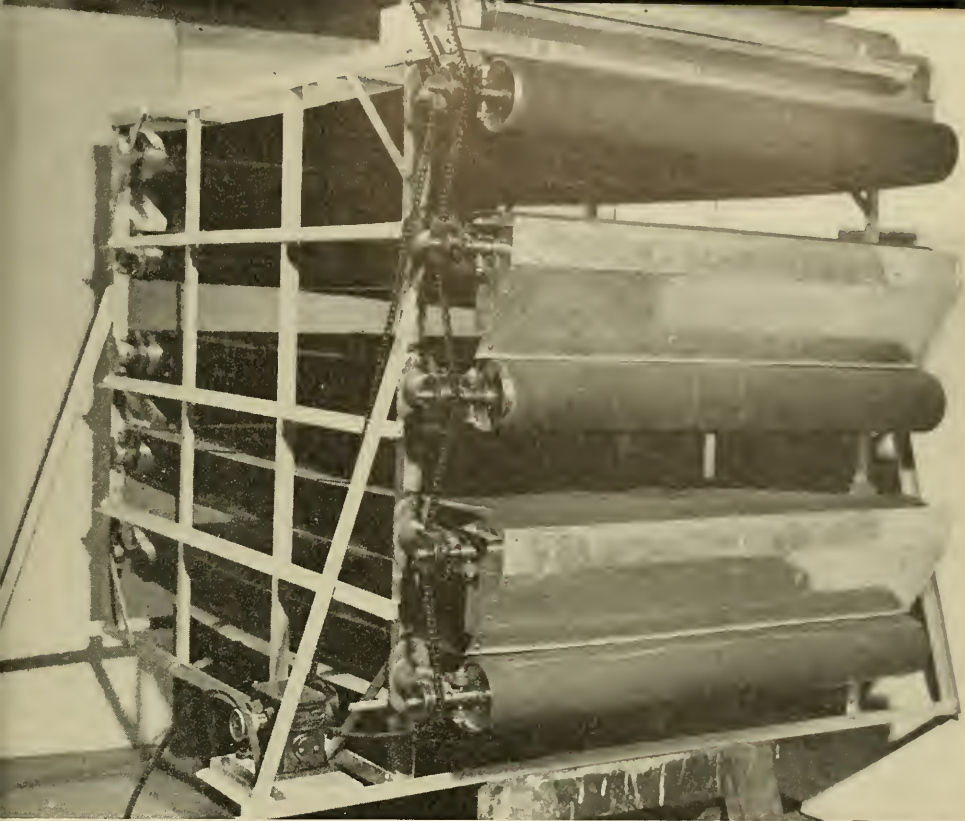
Foxes have a way of reducing the numbers of farm game. In Upshur County one of our practices is to trap foxes intensively. From the kill, Maurice Brooks and R. F. Dugan are preserving the stomachs. They'd like to know what's inside.

Meantime, censusing of rabbits by trapping, and inventory of other game species by observation, goes on in Upshur.

On a check area of like size, rabbits are being censused, and other game appraised. But no fox trapping here. We'll get a better idea this way just how important those foxes can be.

Standard conservation practices in any Soil Conservation District are bound to alter the wildlife situation.





he Conveyor System in Our Pasteurizer Is Built of Aluminum Framing and Rolls, with Neoprene Belting

Selected farms in the Tygart District have carried out wildlife plantings, food-patch plantings, shrub borders, farm ponds, and other measures. Aim is to encourage wildlife.

On another area, Brooks and Dugan have set up a cooperative

hunting area. Hunting is allowed only under permit of the landowners. These in turn decide how many permits they will issue in a season. Hunting pressures in this area have really lessened and, believe me, the owners are for it.

Special Topics

for better, more salable farm sidelines

There's syrup—good syrup—in our hills. Over at Mt. Storm, in Hampshire County, R. W. Pease has designed and built a home bottling

unit for use in the sugar bush. The farmers have bottled and marketed about 8000 pints of U. S. Fancy syrup. Pease also designed a labeling machine for home use.

Pease and E. H. Tryon have con

cerned themselves with the holly trade. Research here takes the line of investigating a treatment and a pack that will improve the sheen and the keeping quality. And in the Swiss colony of Helvetia, in Randolph County, they are working out a holly-marketing program for the 4-H club.

Tryon in cooperation with Wilbur Steiner of U.S.D.A. has developed an inexpensive method for rooting holly cuttings. That opens the possibility of selling pedigreed holly stock. One suitable coldframe has been installed in Nicholas County and one other is under construction at Helvetia.

For the nutmeats project, our researchers in Forestry and Engineering have designed and built a pasteurizer to be used in a ratproof plant for cracking and packing walnuts at Heaters, in Braxton County. They also have experimented with ways to vacuum-seal nuts at home, to be sold in a special pack, properly labeled, in markets demanding quality products.

a pasteurizer for walnut meats

We have proved to our satisfaction that walnut meats can be pasteurized and made entirely safe to eat. Our foresters and bacteriologists (H. D. Erickson and A. R. Colmer) have devised a method that works. It was left for our hillculturist and engineers to design and build a pasteurizer that could be used on a commercial scale.

R. W. Pease and Roy Emerson have built such a unit and it is now in commercial operation. You can see it at Mr. Marple's store in Heaters, Braxton County. The machine is 6 feet on a side and handles about 80 pounds of nut meats per hour. It

is operated by electricity, with full automatic controls for heat, moisture, and air pressure.

One of these days we will have plans and specifications for building such units.

most fungi are helpful to man

In the pursuit of agricultural research there are bound to be some activities which seem to have no early practical value to you or your neighbor. These studies deal with basic problems, and at times they seem quite remote from practical application. Yet, in the end, basic research is the seed from which practical research reaps its reward.

At the West Virginia Station H. L. Barnett and V. G. Lilly are working on a long-range problem with fungi that are able to produce disease in plants. Maybe some improvement in the control of plant disease will result. While most of us may think of fungi as the children of darkness, it should not be forgotten that most fungi are helpful to man. The making of bread and cheese rests upon the work of these minute forms of life. The healing agents known as penicillin, streptomycin, and a host of the newer antibiotics are produced by fungi.

Just to give you an idea of what our experts have to work with, let me cite you the sort of factors they must study in connection with one of their organisms: (1) treatment with dry air and with moist air; (2) oxygen in the air; (3) length of time in which light is used; (4) length of time in which darkness is used; (5) temperature; (6) acidity; (7) density of food for the organism; (8) source of carbon; (9) source of nitrogen;



What Environment Can Do to a Common Fungus (*Phycomyces blakesleeenanus*). Left: Grown for 2 Weeks in Constant Light. Right: Grown for 2 Weeks in Constant Darkness

(10) dilution of medium; (11) effect of vitamins.

If success crowns our efforts, the practical application will follow. The sure and firm foundation of practical application lies in basic research.

production goals that can be realized

Before World War II, the U. S. Department of Agriculture undertook to set agricultural production goals that could be realized. In West Virginia, as in each state, a committee of Experiment Station workers was set up with W. W. Armentrout as leader. Each year a confidential report was sent to the Secretary of Agriculture in Washington.

He in turn used these state reports in announcing production goals for each state.

The work done under this project underlay the Agricultural Production Program carried on during the war and afterward by all agencies of U.S.D.A. As a result, some interest has developed in West Virginia in production planning for agriculture. (The West Virginia Station provided the basis for setting up the goals.)

how good are standard hay-harvest methods?

Here is a project that some day can benefit every farmer who makes hay—and that takes in nearly every one. We have undertaken (1) to study

hay-harvesting methods: (2) to compare methods of cutting, curing, loading, and storing; (3) to look for improvements that can be made in going practices; and (4) to see where each method is best for some situations.

Last year G. E. Toben, W. W. Armentrout, G. G. Pohlman, A. D. Longhouse, and R. E. Emerson collected facts from 119 farmers in northern and western counties. These cooperators gave them information on mowing hay with different-sized mowers drawn by horses, tractors, and trucks. Their methods included hand-pitching, buck rakes, loaders, balers, stationary choppers, and field choppers. Twenty-four farmers told how they cured hay in the barn with forced air.

No one method of harvesting hay is best. Just because your neighbor has a baler, a chopper, or other modern equipment is not enough reason for you to buy one. Try improving your present method. Most likely you can store better hay at less cost if you improve your present method. Quite likely you will do a better job with this method than with a new one.

Farm machinery is expensive. Buying modern hay machinery may make high-priced hay if your acreage is small. Figure out what you can save in time, cost, and hay quality before you change methods. Many West Virginia farmers with small acreages still find that the "old-fashioned method" is the cheapest.

which type of 4-H club is best?

Boys' and girls' clubwork is so well established in West Virginia as elsewhere that no one questions its value to the youth of the land. Many

counties employ a 4-H club agent; in others the county or home demonstration agent lends a hand. Today some 25,000 youngsters between 10 and 18 are enrolled in the state.

But this work breaks down into two types of organization. A club in each case is sponsored by either the community or the school. And thereby hang some problems. There is a difference in the vitality of many clubs.

W. F. Porter, Jr., with the help of C. C. Anderson of the Extension Division, is making a detailed study of these two types of organization. Questionnaires have gone into each of the 52 counties carrying 4-H clubwork. These inquire into type of club, club leadership, and membership. General information about the social, economic, and physical conditions surrounding the club is also requested.

In the second phase of the study, Porter will do field work in selected counties. Also he will make personal interviews with club leaders in those counties.

This study should reveal much about the pros and cons of the community type vs. the school type of 4-H club.

new work under way in our shop

The West Virginia Agricultural Experiment Station has a new set of projects under its wing. These should go far toward solving some of our many production and marketing problems. The projects are made possible through a grant from the Federal Government under the new Research and Marketing Act.

About a dozen different projects have been started under these funds during the past year. Naturally it



is too early for results. But the least we can do is to give you the titles of these projects, and maybe tell a little about them:

Marketing West Virginia Eggs. (A perennial chestnut that should be cracked some day.)

Economics in Marketing, and Benefits to the Consumer from an Even Milk Production. Milksheds don't always stay put. There are variations each season in market supplies and in consumption of milk.

Determination of Housing Needs, and What Farm Families Prefer. The Northeast Regional Farm Housing Research Committee is co-operating.

The Best Type of Stall for Dairy Cows. After all, Bossie should have comfort and cleanliness if she is to deliver the goods.

The Most Efficient and Economical Ways of Removing Manure and Litter from Dairy Barns. A mechanical gutter cleaner would save time and labor.

The Nutritional Standing of Human Beings. Students at West Virginia University will be guinea pigs in this study. What they eat, what their blood is made of, and the physical status will be studied.

Chemical and Physical Analyses of the Blood of Dairy Cows. A study of the problem of sterility.

Improving the Reproductive Performance of Turkeys. Broadbreasted turkeys will be used in this experiment.

Maintaining Profitable Stands of Alfalfa. Plots have been established at Wardensville, Reedsville, Morgantown, and Lakin. Lime and fertilizer treatments will be studied in their effect on the crop.

Chemicals for Eradicating Trees and Bushes. Known weed killers will be used on various weed species.

Storage and Market Diseases of Tree Fruits. Storage diseases of the apple will be examined. Also cherries (bitter rot) and peaches (brown rot).

Marketing Apples and Peaches. How much more is the consumer willing to pay for a bushel of apples that is entirely free of bruises? In Washington, D. C., Baltimore, Maryland, Pittsburgh, Pennsylvania, and Morgantown, West Virginia, he will have the chance to show his preference. In those cities, retail stores will advertise both kinds of fruit—those handled in the usual commercial way, and those given special handling in picking, packing, and transporting.

Cause of Red Clover Failures, and Their Remedy. Of particular importance where seed is produced.

CHANGES IN PERSONNEL

New appointments within our research staff during the 2-year period 1946-1948 include J. K. Bletner, assistant poultry husbandman; D. R. Browning, assistant agronomist; David R. Creel, photographer; G. G. Marra, associate forester; N. O. Olson, animal pathologist; Roger W. Pease, assistant hill-culturist; Ward F. Porter, Jr., assistant rural sociologist; G. E. Toben, associate in farm management; J. R. Webb, assistant in agronomy; Marion Wharton, research nutritionist; H. A. Wilson, associate bacteriologist.

Promotions include H. L. Barnett, mycologist; R. H. Black, associate animal husbandman; M. G. Brooks, forester; J. B. Byers, assistant forester; J. H. Clarke, associate agricultural economist; R. E. Emerson, assistant agricultural engineer; Torkel Holsoe, associate forester; George Hyatt, Jr., dairy husbandman; O. M. Neal, assistant horticulturist; C. F. Taylor, plant pathologist; W. J. Tyler, assistant dairy husbandman; A. H. VanLandingham, biochemist.

During the same period the following have resigned: Lowell Besley, forester; W. M. Broadfoot, assistant agronomist; A. R. Colmer, associate bacteriologist; H. D. Erickson, forester; Stanford Fertig, assistant in agronomy; M. A. McHale, assistant animal pathologist; T. C. McIlvaine, associate agronomist (retired); A. S. Margolin, assistant hillculturist; W. M. Nelson, photographer; J. H. Rietz, animal pathologist (emeritus); O. E. Schubert, assistant in horticulture; J. R. Vaughn, assistant plant pathologist; Marion Wharton, research nutritionist.

Anthony Berg, a member of our plant pathology staff since 1913, died early in 1948.

PUBLICATIONS OF THE BIENNIUM 1946-1948

BULLETINS AND CIRCULARS

- Bul. 326. J. G. Leach and C. F. Bishop. Purple-top wilt (blue stem) of potatoes. June 1946.
- Bul. 327. R. M. Smith, G. G. Pohiman, F. W. Schaller, and D. R. Browning. Pastures improved with tillage, treatment, seed. January 1947.
- Bul. 328. M. A. Abrahamsen. Income from apples in the Eastern Panhandle. January 1947.
- Bul. 329. C. E. Stockdale. Lime supplies in West Virginia. June 1947.
- Bul. 330. C. R. Orton and Gerald Jenny. Through research to better farming. Biennial report of the director for the period 1944-1946. June 1947.
- Bul. 331. T. B. Clark, T. D. Runnels, J. H. Rietz, and C. E. Weakley, Jr. Effect of certain protein levels on egg production and mortality in White Leghorns. June 1948.
- Bul. 332. B. H. Schneider and A. H. VanLandingham. Feeding value of hay stored in stack and in mow. June 1948.
- Cir. 81. T. B. Clark and C. J. Cunningham. Control "pasting up" in baby chicks. June 1948.

MIMEOGRAPHED CIRCULARS

- No. 58. J. L. Cartledge, R. J. Friant, R. E. Strosnider, R. M. Smith, and B. J. Patton. Results of hybrid corn-yield trials in West Virginia for 1946. February 1947.
- No. 59. J. L. Cartledge, E. H. Tyner, R. J. Friant, and B. M. Ritter. Results of hybrid corn-yield and fertilizer trials in West Virginia for 1947. February 1948.

SCIENTIFIC PAPERS

- No. 342. R. H. Sudds. Growth and fruitfulness of two apple varieties, Winesap and Delicious, on French crab seedlings and on the T-200 clonal rootstock. *Proc. Amer. Soc. Hort. Sci.* 48: 187-189. 1946.
- No. 343. R. H. Sudds. Twelve years' results of orchard tests with apple trees on selected rootstocks, Kearneysville, W. Va. *Proc. Amer. Soc. Hort. Sci.* 48: 180-186. 1946.
- No. 344. C. R. Orton. Soil in relation to health. *Ohio State Medical Jour.* 42, no. 1: 40-44. January 1946.
- No. 345. E. H. Tyner and J. R. Webb. The relation of corn yields to nutrient balance as revealed by leaf analysis. *Jour. Amer. Soc. Agron.* 38, no. 2: 173-185. February 1946.

- No. 346. R. M. Smith and D. R. Browning. Influence of evacuation upon laboratory percolation rates and wetting of undisturbed soil samples. *Soil Sci.* 62, no. 5, 243-253. September 1946.
- No. 347. G. G. Pohlman. Effect of liming different soil layers on yield of alfalfa and on root development and nodulation. *Soil Sci.* 62, no. 3, 255-265. September 1946.
- No. 348. A. Berg and Genevieve Chulo. The relation of manganese to internal bark necrosis of apple. *Sci.* 104, no. 2699: 265-266. September 20, 1946.
- No. 349. E. H. Tyner and R. M. Smith. The reclamation of the strip mined coal lands of West Virginia with forest species. *Soil Sci. Soc. of Amer. Proc.* 10: 129-126. 1945.
- No. 350. R. M. Smith and D. R. Browning. Occurrence, nature, and land use significance of "siltpan" subsoils in West Virginia. *Soil Sci.* 62, no. 1: 307-317. October 1946.
- No. 351. H. W. Thurston, J. B. Harry, F. H. Lewis, A. B. Groves, and C. F. Taylor. Glyoxaliness as foliar fungicides: II. Field studies. *Contrib. Boyce Thompson Inst.* 14, no. 3: 163-171. January-March 1946.
- No. 352. L. M. Peairs. DDT and hornfly populations. *Jour. of Econ. Ent.* 39, no. 1: 91-92. 1946.
- No. 353. R. H. Sudds. Can apple trees on clonal rootstocks be recommended for commercial orchards in the Shenandoah Valley? *Proc. Amer. Soc. Hort. Sci.* 48: 245-248. 1946.
- No. 354. W. H. Childs. Shredded sphagnum vs. peat and sand as a medium for transplanted blueberry seedlings. *Proc. Amer. Soc. Hort. Sci.* 47: 206-208. 1946.
- No. 355. J. G. Leach and M. A. Ryan. The cytology of *Ustilago striiformis* forma *poae pratensis* in artificial culture. *Phytopath.* 36, no. 10: 876-886. October 1946.
- No. 356. C. F. Taylor and J. A. Rupert. A study of vegetable seed protectants. *Phytopath.* 36, no. 9: 726-749. September 1946.
- No. 357. D. N. Putnam and H. O. Henderson. The effect of pregnancy on the body weight of dairy cows. *Jour. Dairy Sci.* 29, no. 10: 657-661. October 1946.
- No. 358. A. H. VanLandingham, C. E. Weakley, Jr., and P. B. Lyon. Influence of certain constituents in the diet on the pH of the gastrointestinal tract of the rat. *W. Va. Acad. of Sci. Proc.* 18: 48-52. 1946. *In* W. Va. Univ. Bul. ser. 47, no. 9-1. March 1947.
- No. 359. V. G. Lilly and H. L. Barnett. The influence of pH and certain growth factors on mycelial growth and perithecial formation by *Sordaria fimicola*. *Amer. Jour. Bot.* 34, no. 3: 131-138. March 1947.
- No. 360. H. L. Barnett and V. G. Lilly. The effects of biotin upon the formation and development of perithecia, asci, and ascospores by *Sordaria fimicola* Ces. and de Not. *Amer. Jour. Bot.* 34, no. 4: 196-204. April 1947.
- No. 362. R. M. Smith and D. R. Browning. Some suggested laboratory standards of subsoil permeability. *Soil Sci. Soc. of Amer. Proc.* 11: 21-26. 1946.
- No. 363. J. R. Vaughn and J. G. Leach. A comparison of certain potato sprays in different localities in West Virginia. *Amer. Potato Jour.* 24, no. 3: 76-82. March 1947.
- No. 364. R. S. Marsh and C. F. Taylor. Observed residual effects on apples of 2-4-D in a central spray system. *Amer. Soc. Hort. Sci.* 49: 59-62. 1947.
- No. 365. W. H. Childs. Influence of fineness of shredding on value of sphagnum as a medium for transplanted blueberry seedlings. *Proc. Amer. Soc. Hort. Sci.* 49: 208-210. 1947.
- No. 366. E. H. Tyner. The relation of corn yields to leaf nitrogen, phosphorus, and potassium content. *Soil Sci. Soc. of Amer. Proc.* 11: 317-323. 1946.
- No. 368. A. H. VanLandingham and P. B. Lyon. Inadequacy of diets containing whole grain cereals supplemented with soybean oil meal for lactation and growth of young rats. *Archives of Biochem.* 13, no. 3: 175-180. June 1947.
- No. 369. A. R. Colmer and H. D. Erickson. Improved technique for enumeration of *Escherichia coli* on black-walnut meats. *Sci.* 105, no. 2735: 582. May 30, 1947.
- No. 373. E. H. Tyner. Determining small amounts of calcium in plant materials (a colorimetric method). *Anal. Chem.* 20: 76-80. January 1948.
- No. 374. H. L. Barnett and V. G. Lilly. The relation of thiamin to the production of perithecia by *Ceratostomella fimbriata*. *Mycologia* 39, no. 6: 699-708. November-December 1947.

- No. 376. A. R. Colmer and M. E. Hinkle. The role of microorganisms in acid-mine drainage: a preliminary report. *Sci.* 106, no. 2751: 253-256. September 19, 1947.
- No. 377. R. C. Meade, V. B. Fish, and R. B. Dustman. The determination of pectic materials in apples — the use of 19% hydrochloric acid and pectinol A. *Plant Physiol.* 23, no. 1: 98-111. 1948.
- No. 378. R. B. Dustman, R. C. Meade, and V. B. Fish. Pectic content of apples in relation to thiocyanate sprays. *Plant Physiol.* 23, no. 1: 142-148. 1948.
- No. 380. W. J. Tyler and G. Hyatt, Jr. The heritability of official type ratings and the correlation between type ratings and butterfat production of Ayrshire cows. *Jour. Dairy Sci.* 31, no. 1: 63-70. January 1948.
- No. 381. H. D. Erickson and A. R. Colmer. Pasteurization of black-walnut meats. *Food Res.* 13, no. 5: 417-431. 1948.
- No. 382. G. Hyatt, Jr., and W. J. Tyler. Variations in type ratings of individual Ayrshire cows. *Jour. Dairy Sci.* 31, no. 1: 71-79. January 1948.
- No. 383. R. M. Smith and D. R. Browning. Soil-moisture tension and pore-space relations for several soils in the range of the field capacity. *Proc. Soil Sci. Soc. of Amer.* 12: 17-21. 1947.
- No. 334. E. H. Tyner, R. M. Smith, and S. L. Galpin. Reclaiming strip-mined areas in West Virginia. *Jour. Amer. Soc. Agron.* 40, no. 4: 313-323. April 1948.
- No. 385. H. L. Barnett and V. G. Lilly. The interrelated effects of vitamins, temperature, and pH upon vegetative growth of *Sclerotinia camelthae*. *Amer. Jour. Bot.* 35 no. 5: 297-302. May 1948.

RESEARCH PROJECTS OF THE BIENNIUM

AGRONOMY AND GENETICS

- | | |
|---|--|
| Corn genetics & breeding (B J 3) | Fusarium wilt of watermelon (P 31; coop. |
| Forest soils (B J 9; coop. Plant Pathology) | Horticulture & Plant Pathology) |
| Soil slips in W. Va. (B J 15; coop. SRC & SCS) | Properties of selected soil profiles (P 35; coop. Horticulture & SCS) |
| Reclaiming eroded soils (B J 17; coop. Forestry & SCS) | Pasture renovation (P 43; coop. SCS) |
| Effect of fertilizer treatments & cropping systems on yield & quality of tobacco (B J 19; coop. USDA) | Foliar nitrogen, phosphorus, & potassium interactions as influenced by fertilization & soil-nutrient supplies (P 45) |
| Breeding & improvement of pasture grasses & legumes (B J 26; coop. Plant Pathology & USDA) | Boron content & requirements of certain W. Va. soils (P 47) |
| Improvement of supply & utility of water on farms (B J 34; coop. Animal Husbandry & Dairy Husbandry) | Maintaining profitable stands of alfalfa (R M 10) |
| Revegetation of strip-mined land in W. Va. (B J 39; coop. Forestry & SCS) | Variety testing (S 6) |
| Selection & breeding of superior strains of red clover for W. Va. (B J 43) | Soil Survey work in W. Va. (S 8) |
| Soil acidity & plant growth (P 2; coop. Biochemistry) | Alfalfa investigations (S 10) |
| Plant-nutrient availability (P 29) | Crop-rotation experiments (S 11) |
| W. Va. pastures (P 30; coop. Dairy Husbandry, Animal Husbandry, & USDA) | Sweet-clover investigations (S 13; coop. Biochemistry) |
| | Crop responses to various fertilizers (S 14) |
| | Changes in soil condition following mine sealing, tile draining, & surface treatment (S 40). |
| | Road-bank stabilization (S 50) |

ANIMAL HUSBANDRY

- | | |
|---|--|
| Effect on broilers of selection in cross-breeding (A 7) | Selection of breeders in relation to longevity of progeny in S. C. White Leghorns (B J 13) |
| Improving market qualities of turkeys by cross-breeding (B J 5) | Effect of hay-storage methods on nutritive |

value for sheep & beef cattle (B J 21; coop. Biochemistry)
 Immature grass & legume silage for chickens (B J 36; coop. Biochemistry & Agricultural Engineering)
 Effects of thyroid stimulants & depressants on growth & fattening of swine (B J 47)
 Values for growth of proteins in poultry feeds (P 4; coop. Biochemistry)
 Breed as factor in sheep production & quality of products (P 5; coop. USDA)
 Silages for cattle & sheep (P 34; coop. Biochemistry)
 Digestibility of feeds (P 36; coop. Agricultural Economics)

Phenothiazine & salt mixture as an anthelmintic for ewes and lambs (P 38)
 Methods of feeding chicks & pullets (P 39)
 Comparison of native & Western ewes for production and longevity (P 11)
 Birth weight within breeds and growth rate of purebred mutton-type lambs (P 50)
 Improving reproduction performance of turkeys (R M 9)
 Comparison of calcium supplements for poultry (S 51; coop. Biochemistry)
 Legume-grass silage vs. corn silage for wintering beef cows (S 53; coop. Biochemistry)

BIOCHEMISTRY (AGRICULTURAL)

Pigmentation & ripening of fruits (A 3)
 Isolation, purification, & determination of hemicellulose in feeds & foods (A 12)
 Feeding of thyroprotein to dairy cattle (B J 38; coop. Dairy Husbandry & Animal Husbandry)

Factors needed to supplement rations for satisfactory growth, reproduction, & lactation (B J 51)
 Human nutritional status in W. Va. (R M 7; coop. Home Economics)
 Miscellaneous investigations (S 5)

ECONOMICS (AGRICULTURAL)

War-production goals & their attainment in W. Va. (B J 31; coop. USDA)
 Broiler industry in Northeastern W. Va. (B J 40)
 Harvesting hay in W. Va. (B J 50; coop. Agricultural Engineering & Agronomy)
 Practices, costs, & returns in production of agricultural products of W. Va. (B J 52)
 Agricultural lime supply in W. Va. (P 44)
 Population adjustments in W. Va. (P 46)

Seasonal milk production on W. Va. farms (P 48)
 Some factors affecting vitality of 4-H Club work in W. Va. (P 52; coop. Ext. Div.)
 Marketing W. Va. apples & peaches (R M 1; coop. N. E. Region)
 Marketing W. Va. eggs (R M 2; coop. N. E. Region)
 Marketing economics & consumer benefits from even milk production in W. Va. (R M 3; coop. N. E. Region)

DAIRY HUSBANDRY

Breeding efficiency of dairy cows (B J 42; coop. Animal Husbandry)
 Use of type & production records for dairy-cattle improvement program (B J 45; coop. Agricultural Economics)
 Transmission of milk & butterfat production & body conformation of dairy sires (P 14)

Oxidized flavors in milk (P 23; coop. Biochemistry)
 Keeping quality of milk in home refrigerators (P 49)
 Preparatum milking of dairy heifers (P 51)
 Chemical & physical analyses of blood of dairy cows (R M 8; coop. Animal Husbandry & N. E. Region)

ENGINEERING (AGRICULTURAL)

Determination of housing needs & preference of farm families in W. Va (R M 4; coop. Home Economics & N. E. Region)
 Optimum stall for dairy cows (R M 5; coop.

N. E. Region)
 Methods of removing manure & litter from dairy barns (R M 6; coop. N. E. Region)
 Design & construction of hay hoists (S 17)

ENTOMOLOGY

Relation of temperature & other physical factors to insects (A 1)

Biological & mechanical control of codling moth (B J 1; coop. USDA)

Biology & control of insects of major importance in commercial orchards (P 9)

Miscellaneous insect & insecticide studies (S 24)

FORESTRY

Conservation of farm woodlands through sustained-yield management & marketing practices (B J 7)

Effect of black-walnut trees & their products on vegetation (B J 22)

Forest taxation in W. Va. (B J 29)

Growth conditions as related to physical properties of Appalachian hardwoods (B J 35)

Management of farm fish ponds (B J 41; coop. W. Va. CC)

Mobile circular sawmill for farm woodlots (B J 44)

Forest measurements by aerial photographs

(B J 46)

Efficient forest management practices for W. Va. cut-over & burned-over hardwood forest lands (B J 49)

Chemicals for eradication of trees & bushes (R M 12)

Profitable tree forms (S 37)

Improvement of farm game & wildlife conditions on a soil-conservation district (S 42)

Production, development, & marketing of hillculture products in W. Va. (S 49)

Plantings of forest trees & shrubs at Green-land Gap (S 56)

HILLCULTURE

Design & construction of a pasteurizer for

nut meats (S 57; coop. Agricultural Engineering)

HOME ECONOMICS

Ascorbic-acid metabolism (B J 48; coop. Biochemistry)

Preserving vegetables & small fruits by freezing (S 55)

HORTICULTURE

Improvement of potato varieties (A 11; coop. Plant Pathology)

Selection, breeding, & propagation of low-bush blueberry, *Vaccinium vacillans* (B J 12)

Effect of cultural practices & management on soil moisture & availability of plant nutrients to fruit trees (B J 16)

Green-manure rotations for soil fertility in vegetable-crop production (P 11)

Improvement of fruit-tree root stocks (P 16; coop. USDA)

Miscellaneous horticultural investigations (S 27)

Variety tests of tree & small fruits (S 29)

Variety & strain studies of vegetables (S 31)

PLANT PATHOLOGY

Effect of environment upon morphology & parasitism in fungi & bacteria (A 6)

Anatomical & histological changes in diseased plants (A 10)

Nature & effect of substances which induce or stimulate growth & sexuality in fungi (B J 2)

Spray injury & fungicidal efficiency of orchard sprays as influenced by weather (B J 6)

Testing new fungicides (potatoes & vegetables) (B J 32)

Apple measles (P 19)

Black root-rot of apples (P 21)

Control of loose smuts through hot-water seed treatment (P 40; coop. Agricultural Engineering & Agronomy)

Storage & market diseases of tree fruits (R M 13)

Cause & remedy for red-clover failures in W. Va. (R M 14; coop. Agronomy)

Forest-tree diseases (S 18)

Miscellaneous plant-disease investigations (S 19)

Pasteurization of nut meats (S 52; coop. Forestry)

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FINANCIAL STATEMENT

Classification of Expenditures of Federal and State Funds by the West Virginia Agricultural Experiment Station July 1, 1947, to June 30, 1948

	FEDERAL FUNDS					STATE FUNDS	
	Hatch	Adams	Purnell	Bankhead Jones	Research & Marketing 9bl-2	Marketing 9b3	
Personal services	\$13,241.67	\$13,250.00	\$51,885.46	\$52,293.23	\$10,217.64		\$107,219.91
Travel	77.08	26.17	472.53	1,831.63	1,701.84	456.97	5,138.15
Transportation of things			.90	17.58			483.67
Communication service	34.05						1,520.84
Rents and utility services	383.22		362.40	1.12			8,094.72
Printing and binding	287.25		123.69	323.08			6,131.68
Other contractual services	35.52	99.62	5,886.53	19.27	48.39		17,660.22
Supplies and materials	941.21	818.34		4,528.82	1,503.57	28.39	74,303.43
Equipment		805.87	1,268.49	1,499.40	1,911.38	514.35	21,478.36
Lands and structures (contractual) ..							15,211.67
Total expenditures	\$15,000.00	\$15,000.00	\$60,000.00	\$60,514.13	\$15,382.82	\$ 999.71	\$257,242.65
Unexpended balances					20,453.58	2,175.29	47,119.54
TOTAL	\$15,000.00	\$15,000.00	\$60,000.00	\$60,514.13	\$35,836.40	\$ 3,175.00	\$304,362.19

**Income of the West Virginia Agricultural Experiment Station
July 1, 1947, to June 30, 1948**

Source of funds		Receipts	Source of funds		Receipts
Federal funds:			State funds:		
Hatch		\$ 15,000.00	State appropriations:		
Adams		15,000.00	Main station		\$ 74,300.00
Purnell		60,000.00	Substations		30,900.00
Bankhead-Jones		60,514.13	Special		30,000.00
Research & Marketing (9b1-2)		35,836.40	Special endowments, grants, etc.		7,700.00
Research & Marketing (9b3)		3,175.00	Sales		107,516.89
			Bal. fwd. from previous year		53,945.30
TOTAL FEDERAL FUNDS		\$189,525.53	TOTAL STATE FUNDS		\$304,362.19

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*As of June 30, 1948.

¹In cooperation with the United States Department of Agriculture.

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